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09/345,761	07/01/99	ISHIGURO	T 054969

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ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/345,761	Applicant(s) Ishiguro, T et al.
	Examiner CB Wilder	Group Art Unit 1655

☒ Responsive to communication(s) filed on *May 16, 2000* .

☒ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire *3* month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) *1-23* is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) *1-23* is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐approved ☐disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☒ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☒ received.

☐ received in Application No. (Series Code/Serial Number) _____ .

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____ .

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). *10*

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

DETAILED ACTION

Priority

1. The request filed on May 16, 2000 for a Continued Prosecution Application (CPA) under 37 CFR 1.53(d) based on parent Application No. 09/345,761 is acceptable and a CPA has been established. An action on the CPA follows.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

(a) Claims 1-20 are indefinite at the recitation of "simple and accurate" because "simple and accurate" are relative terms that are not defined by the claims and the specification does not provide a standard for ascertaining the requisite language. It is suggested to delete "simple and accurate".

(b) Claims 21-23 are indefinite at the recitation of 'simple" because "simple" is a relative term that is not defined by the claims and the specification does not provide a standard for ascertaining the requisite language. It is suggested to delete "simple".

(C) Claims 1-23 are indefinite at the recitation of "almost constant" because it is not clearly defined in the claim or specification what "almost constant" means in relation to the necessary temperature for the assay.

(d) Claims 1-23 are confusing at "a step of measuring a fluorescent signal..."in claim 1 and claim 21 because it is not clear where the step is to be performed. It is suggested to move the step of measuring a fluorescent signal to the end of the claim or where it is intended to be used.

(e) Claims 1-23 are contradictory at "a 3'-end sequence within the specific nucleic acid sequence" of claim 1(B) and claim 21 (A) because an end does not describe something that is within. It is suggested to change "within" to "...of...".

(f) Claims 1-23 are contradictory at "a 5'-end sequence within the specific nucleic acid sequence" of claim 1(E) and claim 21(G) because an end does not describe something within. Clarification is required.

(g) Claims 1-23 are confusing at "from the 5' end" of claim 1 (E) and claim 21(G) because it is not understood whether "from the 5-'end" comes after the 5'-end or towards the 3'-end. Clarification is required.

(h) Claims 18 and 19 lack proper antecedent basis in claim 1 for "uses an acetate" because claim 1 does not recite a buffer, and it is unclear where the acetate is to be used or if it is intended to be used in a buffer.

(I) Claim 20 lack proper antecedent basis in claim 1 for "uses sorbitol" because claim 1 does not recite a buffer, and it is unclear where the sorbitol is to be used or if it is intended to be used in a buffer.

(j) Claims 1-23 is indefinite for "at almost constant temperature" in claims 1 and claim 21 because it is unclear whether "at almost constant temperature" in the preamble is intended to be a condition of "a step of adding reagents". It is suggested to clearly separate the preamble from the method steps and to include recitation of conditions with the appropriate steps.

(k) Claims 1-23 fails to define the meets and bounds of the claimed invention because 'at least the following reagents" indicates that other reagents are added, therefore one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

(l) Claims 14 and 15 are non sequitur to claim 1 and claim 14 because the relationship of the claims to the modified probe of claim 15 or the relationship of the modified probe of claim 15 to the claims is not recited.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the Exr. presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the Exr. to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

4. Claim 1-6, 9-13, 16, and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Davey et al. (Davey, herein) (5,409,818, filing date June 24, 1988)). The rejection of the claims is based on the Exr.'s best understanding of the claimed invention because the claim language is confusing. The applicant has a claimed a method for assaying single-stranded RNA containing a specific nucleic acid sequence in a sample at almost constant temperature by using the following reagents (A) to (I), which comprises a step of adding the reagents (A) to (i) one by one in any order, in combinations of at least two or all at once and a step of measuring the fluorescent signal in the presence of the reagent (i) at least once after the addition of at least the reagents (A) to (H); (A) a first single-stranded oligonucleotide complementary to a sequence neighboring the 5' end of the specific nucleic acid sequence in the single stranded RNA, (b) a second single stranded oligonucleotide complementary to a 3'-end sequence within the specific nucleic acid sequence, (c) an RNA-dependent DNA polymerase, (D) deoxyribonucleoside triphosphates, (E) a third single-stranded oligonucleotide having (1) a promoter sequence for a DNA-dependent RNA polymerase, (2) an

enhancer sequence for the promoter and (3) a 5-end sequence within the specific nucleic acid sequence, (F) a DNA-dependent DNA polymerase, (G) a DNA-dependent RNA polymerase, (H) ribonucleoside triphosphates, and (i) a fourth single-stranded olio-DNA complementary to the specific nucleic acid sequence which is labeled so that it gives off a measurable fluorescent signal on hybridization with a nucleic acid containing the specific nucleic acid sequence.

Davey teaches a method of assaying for single stranded RNA containing a specific nucleic acid sequence in a sample at relatively constant temperature by using the following reagents (A) to (H), comprising a step of adding the reagents in a reaction vessel; (A) a first oligonucleotide primer (the first primer) complementary to a sequence of the specific nucleic acid sequence; (b) a synthetic oligonucleotide (the second primer) complementary to a sequence of the specific nucleic acid sequence that contains at the 5'-end a sequence of a promoter for a DNA-dependent RNA polymerase, a sequence for a transcription initiation site, and a 5'-end sequence, in that order; (c) an RNA-dependent DNA polymerase; (D) deoxyribonucleoside triphosphates; (E) a DNA-dependent DNA polymerase; (F) a DNA-dependent RNA polymerase; (G) ribonucleoside triphosphates; (column 5, lines 26-68 and column 6, lines 1-6) and (H) a probe labeled with a fluorophore (column 9, lines 5-7 and 34-36). Davey does not teach that the oligonucleotide containing the promoter sequence includes an enhancer sequence for the promoter. The Exr. however takes notice that enhancer sequences were routinely used in the prior art with promoter sequences to increase the level of transcription, furthermore The Language of Biotechnology Dictionary (Walker et al., 1995, pages 99-100) defines an enhancer as a nucleotide sequence that dramatically increases promoter efficiency.

Therefore it would have been **prima facie** obvious to one of ordinary skill in the art to include an enhancer sequence for the promoter sequence for the expected benefits of increased transcription. It would also have been **prima facie** obvious to one of ordinary skill in the art at the time the invention was made to modify the detection method of Davey to obtain the claimed invention because the skilled artisan would have been motivated to utilize oligonucleotide sequences as primers that are complementary to the specific nucleic acid sequence of interest with a reasonable expectation of success by the advantages taught by Davey that states that this type of amplification process may be useful to increase the quantity of the specific nucleic acid sequence to allow detection, or to increase the purity of the specific nucleic acid sequence as a substitute for conventional cloning methodologies (abstract). The skilled artisan would have been motivated to combine all the reagents at once or in various combinations and utilize constant temperature with a reasonable expectation of success by the advantages taught by Davey which states that it is preferable that an amplification process require less participation and fewer manipulation by the user. The author further adds that it is advantageous if the amplification process occurs at constant temperature so that the activity of the enzymes involved in the process are not affected. Davey continues by stating that it is more expedient if a template is used to generate more than one product from one substrate in each cycle of an amplification process (column 2, lines 55-63).

Claim 2 is drawn to an embodiment of claim 1 wherein the temperature is selected from a range of from 35 degrees Celsius to 60 degrees Celsius. Davey teaches this embodiment. Davey

discloses utilizing relatively constant temperature for the amplification process of about 42 degrees Celsius (examples 3-9 columns 15-17).

Claim 3 is drawn to an embodiment of claim 1 wherein the first oligonucleotide is a DNA, and the method further comprises a step of adding RNAase H and a subsequent step of deactivating the RNAase H by heating or by the addition of an inhibitor prior to addition of the reagent (B). Davey teaches this embodiment (column 6, line 19 and column 8, lines 20-33).

Claim 4 is drawn to an embodiment of claim 3, wherein the addition of the reagent (A) is followed by simultaneous addition of the reagents (b) to (H), and further by the addition of reagent (I). Davey teaches this embodiment (column 8, lines 35-37 and lines 54-62).

Claim 5 is drawn to an embodiment of claim 3, wherein addition of the reagent A is followed by the simultaneous addition of the reagents (b) to (I). Davey teaches this embodiment as mention above.

Claim 6 is drawn to an embodiment of claim 1, wherein the first oligonucleotide as the reagent (A) is a ribozyme or a DNAzyme. The Exr. takes notice that ribozymes were routinely used in the prior art as a catalyst in methods for assaying RNA. Therefore, it would have been **prima facie** obvious to one of ordinary skill in the art to include a ribozyme as the first oligonucleotide reagent in the method for assaying RNA. The skilled artisan would have been motivated by the convenience of including a ribozyme sequence in the RNA of the claimed invention.

Claim 9 is drawn to an embodiment of claim 7, wherein the enzyme which degrades RNA in a DNA-RNA double strand is the RNA-dependent DNA polymerase as the reagent (C). Davey teaches this embodiment (column 5, lines 26-35).

Claim 10 is drawn to an embodiment of claim 1, wherein an enzyme having both an RNA-dependent DNA polymerase activity and a DNA-dependent DNA polymerase activity is used as the reagent (c) and (F) to virtually omit addition of the reagent (c) or the reagent (F). Davey teaches this embodiment (column 7, lines 48-68 and column 8, lines 1-19).

Claim 11 is drawn to an embodiment of claim 10, wherein the enzyme is avian myoblastome virus polymerase. Davey teaches this embodiment (column 7, lines 53-55).

Claim 12 is drawn to an embodiment of claim 1, wherein the second and third oligonucleotide as the reagents (b) and (E) are used at concentrations of from 0.02 to 1 micro molar. Davey teaches this embodiment (column 17, example 8, line 35).

Claim 13 is drawn to an embodiment of claim 1, wherein the DNA-dependent RNA polymerase as the reagent (G) is at least one enzyme from the group consisting of phage SP6 polymerase, phage T3 polymerase and the phage T7 polymerase. Davey teaches this embodiment (column 7, lines 38-41).

Claim 16 is drawn to an embodiment of claim 1, which further comprises a step of detecting or quantifying the single stranded RNA in the sample based on the measured fluorescent signal or change in the measured fluorescent signal. Davey teaches this embodiment (column 8, lines 54-65).

The method of claim 21 is the same as the method of claim 1, wherein the invention can be used to produce a nucleic acid having a specific nucleic acid sequence. Davey further teaches that the method as described earlier can be used to produce or increase the quantity of a specific nucleic acid sequence (column 3, lines 4-7).

Claim 22 and 23 are drawn to an embodiment of claim 21, wherein a DNase or RNase is added when the measured fluorescent signal or change in the measured fluorescent signal indicates production of a predetermined amount of the specific nucleic acid sequence. Absent unexpected results, the addition of RNase or DNase. The skilled practitioner in the art would have been motivated to add RNase or DNase to the amplification product to obtain a full length product of only DNA or RNA, respectively.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Davey in view of Malek et al. (5,130,238, filing date August 23, 1989). The applicant has claimed an embodiment of claim 1, which further uses dimethylsulfoxide (DMSO) and/or an enzyme which degrades RNA in a DNA-RNA double strand. Davey teaches a method of assaying a specific nucleic acid (RNA or DNA) sequence using an amplification process as discussed earlier. Davey differs from the claimed invention in that Davey does not disclose further using DMSO in the reaction medium. In a method similar to the method of Davey, Malek discloses assaying a specific nucleic acid sequence using an amplification process in which DMSO is included in the amplification reaction medium (Column 14, lines 2-12). Therefore, it would have been **prima facie** obvious to one of ordinary skill in the art at the time the invention was made to modify the detection method of Davey with the method of Malek

to obtain the claimed invention because the skilled artisan would have been motivated to further include DMSO in the reaction process with a reasonable expectation of success by the advantages taught by Malek. Malek discloses that the use of DMSO in an amplification reaction medium provides enhanced sensitivity and reproducibility over the use of reaction medium without DMSO (column 14, lines 13-16). The author further adds that the use of DMSO in the reaction medium also increases the amplification level over that of the reaction medium alone (column 14, lines 18-21).

Claim 8 is drawn to an embodiment of claim 7, which uses DMSO at a concentration of from 5 to 20%. Malek teaches this embodiment (column 14, lines 2-12).

6. Claims 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Davey as described above, in view of Ishiguro et al. (Ishiguro, herein) (Analytical Biochemistry, August 2, 1995). The applicant has claimed an embodiment of claim 1, wherein the fourth oligonucleotide as the reagent (i) is a DNA which is linked to a fluorescent intercalative dye so that the fluorescent intercalative dye changes its fluorescent characteristic on hybridization of the DNA with another nucleic acid by intercalating into resulting double stranded DNA. Davey teaches a method of assaying a specific nucleic acid sequence using an amplification process as discussed earlier. The method of Davey differs from the claim invention in that Davey does not teach using an intercalative fluorescent dye as a label. However, intercalating fluorescent labels were used in the prior art as exemplified by Ishiguro. Ishiguro teaches a method of assaying viral RNA using an amplification procedure that comprises the use of a fluorescent DNA intercalative dye that changes its fluorescent properties when bound to double-stranded DNA (page 207, second column, paragraphs 1-3). Therefore, it would

have been **prima facie** obvious to one of ordinary skill in the art at the time the invention was made to modify the detection method of Daley with the method of Ishiguto to obtain the claimed invention because the skilled artisan would have been motivated to use an intercalative fluorescent dye linked to the oligo-DNA with a reasonable expectation of success by the advantages taught by Ishiguro. Ishiguro discloses that performing an amplification process with a fluorescent DNA intercalative dye allows the quantitative detection of RNA over a wide dynamic range (page 213, second column, lines 1 and 2). Ishiguro further adds that this system is a powerful tool for the quantification of a starting material with excellent reliability and clinical significance (page 213, second column, lines 3-6).

7. Claim 15 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Davey in view of Cleuziat et al (Cleuziat, herein) (5,824,517 filing date May 16, 1997). The applicant has claimed an embodiment of claim 1 or 14, wherein the fourth oligonucleotide as the reagent (i) is a DNA which has a 3-'end sequence uncomplementary to the specific nucleic acid sequence or has a modified 3'-end. Davey teaches a method of assaying a specific nucleic acid sequence using an amplification process as discussed earlier. The claim invention differs from Davey in that Davey does not teach wherein the reagent (i) the fourth oligonucleotide probe is a DNA which has a 3'-end sequence uncomplementary to the specific nucleic acid sequence or has a modified 3'-end. In a method similar to the method of Davey, Cleuziat discloses using an amplification reaction to assay nucleic acid sequences. Cleuziat further discloses wherein an oligonucleotide (reagent I) used as a labeled probe in the amplification reaction has a modified 3' end (column 17, lines 59-68 and column 18, line 1-2). Cleuziat teaches that the label linked to the probe can be a radioisotope, or a

fluorescent label (column 14, lines 22-31). Therefore it would have been **prima facie** obvious to one of ordinary skill in the art at the time the invention was made to modify the detection method of Daley with the method of Cleuziat to obtain the claimed invention because the skilled artisan would have been motivated to use a labeled probe with a modified end with a reasonable expectation of success by the benefits taught by Cleuziat. Cleuziat discloses that modification of an oligonucleotide (primer or probe) to obtain a detection system is useful for reducing the amplification process to a homogeneous system (column 14, lines 32-38).

Claim 20 is drawn to an embodiment of claim 1, which further uses sorbitol. Cleuziat teaches this embodiment (column 9, lines 11-14).

8. Claims 17, 18, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Davey in view of Newton (PCR, Essential Data, 1995). The applicant has claimed an embodiment of claim 1, wherein all the reagents are chloride-free. Davey teaches a method of assaying a specific nucleic acid using an amplification process as described earlier. The claimed invention differs from Davey, in that Davey does not teach wherein all the reagents are chloride-free. In a guide for PCR, Newton discloses an amplification reaction buffer, wherein all the reagents are chloride-free (page 149, table 1, buffer #2). It would have been **prima facie** obvious to one of ordinary skill in the art at the time the invention was made to modify the detection method of Davey with the reaction buffer of Newton to obtain the claimed invention because the skilled artisan would have been motivated to use a reaction buffer that is chloride-free with a reasonable expectation of success for maximizing enzyme

activity in view of Newton's teaching that some enzymes perform better in a PCR buffer than in their standard recommend buffer (page 144, column 1, second paragraph).

Claim 18 is drawn to an embodiment of claim 1, which further uses an acetate. Newton teaches this embodiment (page 149, table 1, buffer #2).

Claim 19 is drawn to an embodiment of claim 18, wherein the acetate is magnesium acetate at a concentration of from 5 to 20 mM or potassium acetate at a concentration of from 50 to 200 mM. Newton discloses using magnesium acetate at a concentration of 10 mM and using potassium acetate at a concentration of 66 mM (page 149, table 1, buffer #2).

Conclusion

9. This is a continuation of applicant's earlier Application No. 09/345,761. All claims are drawn to the same invention claimed in the earlier application and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the earlier application. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action in this case. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the

date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no, however, event will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. No claims are allowed.

11. Any inquiry concerning this communication or earlier communications from the Exr. should be directed to Exr. Cynthia Wilder whose telephone number is (703) 305-1680. The Exr. can normally be reached on Monday through Thursday from 7:00 am to 5:30 pm.

If attempts to reach the Exr. by telephone are unsuccessful, the Exr.'s supervisor, W. Gary Jones, can be reached at (703) 308-1152. The official fax phone number for the Group is (703) 308-4242. The unofficial fax number is (703) 308-8724.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed the Group's receptionist whose telephone number is (703) 308-0196.

Cynthia Wilder

Cynthia B. Wilder, Ph.D.

July 3, 2000

S. Stoner

SUPERVISORY PATENT EXAMINER
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